

## CLAIMS

What is claimed is:

### Claim 1.

High Impact Strength, Elastic ELACO™ Fibre Metal Laminate comprising:

- 5 a) a first outer layer,
- b) a second outer layer,
- c) a first ply,
- d) a second ply, the first and second ply being placed between the first and second outer layers,
- 10 e) at least one dissipating element between the first and second ply adapted to dissipate and redirect randomly directed local loading applied to at least one of the two outer layers, to tensile loading directed in longitudinal direction (tensile) of the first and second plies;
- f) a polymer matrix in between (a), (b), (c) and (d).

### 15 Claim 2

High Impact Strength, Elastic ELACO™ Fibre Metal Laminate as defined in Claim 1 wherein multiple layers of (c), (d), (e) and (f) are placed between the outer layers.

### Claim 3

- 20 High Impact Strength, Elastic ELACO™ Fibre Metal Laminate, as defined in any preceding claim wherein the first and second plies are reinforcement plies.

### Claim 4

- 25 High Impact Strength, Elastic ELACO™ Fibre Metal Laminate, as defined in any preceding claim wherein the dissipating element is one or more elements selected from the group consisting of various metal and non-metallic structures such as: expanded, ornameash, rigidised metal, corrugated sheet, tubes, balls, aluminium foam or other metallic foam-like structures and any other similar forms

### Claim 5.

- 30 High Impact Strength, Elastic ELACO™ Fibre Metal Laminate, as defined in any preceding claim, wherein the dissipating element is made from on or more materials selected from the metallic and non-metallic materials group such as: aluminium alloys, steel alloys, zinc alloys, titanium alloys, copper alloys, magnesium alloys, nickel alloys, aluminium alloy matrix composites, thermoplastics, plastics, polymers foams, wood and rubber.

Claim 6.

High Impact Strength, Elastic ELACOTM Fibre Metal Laminate, as defined in Claim 5, wherein the dissipating ply elements are arranged as: unidirectional, cross-ply, symmetric, balanced, quasi-isotropic or hybrid laminates.

40 Claim 7.

High Impact Strength, Elastic ELACOTM Fibre Metal Laminate as defined in any of Claims 3-6, wherein the reinforcement plies are made from one or more materials selected from the group consisting of: E-glass, R-glass, S2-glass, aramids, carbon and any other single or hybrid sorts of fibre reinforcements as Quadriaxial, Unidirectional, 45 Double-bias, Biaxial, Triaxial, Plain woven or Woven rovings.

Claim 8.

High Impact Strength, Elastic ELACOTM Fibre Metal Laminate as defined in any of claims 1-7, wherein the matrix is made from one or more selected from any known thermosetting and thermoplastic matrix group such as: Vinylester, Epoxy, Phenolic, 50 fire retardant and corrosion resistant resin and suitable adhesive(s).

Claim 9.

High Impact Strength, Elastic ELACOTM Fibre Metal Laminate as defined in Claim 8, wherein any known coatings and/or pigments are added to the matrix.

Claim 10.

55 High Impact Strength, Elastic ELACOTM Fibre Metal Laminate, as defined in Claim 7, wherein the reinforcement plies are arranged as: unidirectional, cross-ply, symmetric, balanced, quasi-isotropic or hybrid laminates.

Claim 11.

60 High Impact Strength, Elastic ELACOTM Fibre Metal Laminate, as defined in any of claims 1-10, wherein the outer layers are made from any metallic and non-metallic or more materials selected from the group such as: aluminium alloys, steel alloys, zinc alloys, titanium alloys, copper alloys, magnesium alloys, nickel alloys; alloy matrix composites, wood, plastics, rubber, paper, thermoplastics, polymers, foams and rubber.

65 Claim 12.

High Impact Strength, Elastic ELACOTM Fibre Metal Laminate, as defined in any of the claims 1-11, further having at least one additional layer based on one or more metallic and non-metallic materials such as: foams, wood, rubber, honeycomb structures, thermoplastics, plastics, polymers, hybrid sandwiches, paper.

70 Claim 13.

High Impact Strength, Elastic ELACOTM Fibre Metal Laminate, as defined in any of claims 1-12, characterised in that the laminate is used in combination with structures made from metallic and non-metallic materials such as: wood, thermoplastics, plastics, polymers, foams, hybrid sandwiches, rubber, paper or/and honeycomb 75 structures.

Claim 14.

80 High Impact Strength, Elastic ELACO™ Fibre Metal Laminate, as defined in any of claims 1-13, characterised in that the use of the at least one dissipating element creates the equilibrium of dissipated loadings in the laminate structure with a component of the outer loading being redistributed in a longitudinal direction to the main axis of the reinforcement plies.

Claim 15.

Nanostructure comprising:

- a) a first outer layer;
- 85 b) a second outer layer;
- c) a first ply;
- d) a second ply, the first and second ply being placed between the first and second outer layers;
- 90 e) at least one dissipating element between the first and second plies adapted to dissipate and redirect randomly directed local loading applied to at least one of the two outer layers, to tensile loading directed in longitudinal direction (tensile) of the first and second plies;
- f) a polymer matrix in between (a), (b), (c) and (d).

Claim 16.

95 Nanostructure as defined in claim 15 wherein multiple layers of (c), (d), (e) and (f) are placed between the outer layers.

Claim 17.

Nanostructure as defined in claim 15 or 16 wherein the first and second plies are reinforcement plies.

100 Claim 18.

Nanostructure as defined in any of claims 15-17, wherein the dissipating element is one or more elements selected from the group consisting of various metallic and non-metallic materials structures such as: expanded ornameash, rigidised, corrugated sheet, tubes balls, and any other similar forms.

105 Claim 19.

110 Nanostructure as defined in any of claims 15-18, wherein the dissipating element is made from on or more metallic and non-metallic materials such as: aluminium alloys, steel alloys, zinc alloys, titanium alloys, copper alloys, magnesium alloys, nickel alloys, aluminium alloy matrix composites, thermoplastics, plastics, polymers foams, wood and rubber.

Claim 20.

115 Nanostructure as defined in Claim 19, wherein the dissipating ply elements are arranged as: unidirectional, cross-ply, symmetric, balanced, quasi-isotropic or hybrid laminates.

Claim 21.

120 Nanostructure as defined in any of Claims 17-20, wherein the reinforcement plies are made from one or more materials selected from the group consisting of: E-glass, R-glass, S2-glass, aramids, carbon and any other single or hybrid fibre reinforcements as Quadriaxial, Unidirectional, Double-bias, Biaxial, Triaxial, Plain woven or Woven rovings.

Claim 22.

125 Nanostructure as defined in any of claims 15-21, wherein the matrix is made from one or more selected from any known thermosetting and thermoplastic matrix group: Vinylester, Epoxy, Phenolic, fire retardant and corrosion resistant resin and suitable adhesive(s).

Claim 23.

130 Nanostructure as defined in Claim 22, wherein any sort of coatings and/or pigments are added to the matrix.

Claim 24.

Nanostructure as defined in Claim 21, wherein the reinforcement plies are arranged as: unidirectional, cross-ply, symmetric, balanced, quasi-isotropic or hybrid laminates.

Claim 25.

135 Nanostructure as defined in any of claims 15-24, wherein the outer layers are made from one or more materials selected from any metallic and non-metallic group such as: aluminium alloys, steel alloys, zinc alloys, titanium alloys, copper alloys, magnesium alloys, nickel alloys, alloy matrix composites, wood, plastics, rubber, paper, thermoplastics, polymers, foams and rubber.

Claim 26.

140 Nanostructure as defined in any of claim 15-25, further having at least one additional layer based on one or more selected from the following group: foams, wood, rubber, honeycomb structures, thermoplastics, plastics, polymers, hybrid sandwiches and paper.

Claim 27.

145 Nanostructure as defined in any of claims 15-26, characterised in that the laminate is used in combination with structures made from any of metallic and non metallic materials such as: wood, thermoplastics, plastics, polymers, foams, hybrid sandwiches, rubber, paper or/and honeycomb structures.

Claim 28.

155 Nanostructure as defined in any of claims 15-28, characterised in that the use of at least one dissipating element creates the equilibrium of dissipated loadings in the laminate structure with a component of the outer loading being redistributed in a longitudinal direction to the main axis of the reinforcement plies.

Claim 29

High Impact Strength, Elastic ELACO™ Fibre Metal Laminate substantially as herein described with reference to any one of figures 1-3 of the accompanying drawings.

Claim 30

160 Nanostructure substantially as herein described with reference to any one of figures 1-3 of the accompanying drawings.

165

170